AGRICULTURAL TRADE: PROSPECTS FOR LONG-TERM RECOVERY

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Recent farm export gains have been almost as spectacular as the export drop of 39 percent from the $43.8 billion high of fiscal year 1981 to $26.3 billion in 1986. U.S. farm export volume and value increased nearly one-third the last two years (Table 1).

Table 1. U.S. Farm Export Volume and Value

	Fiscal Year			Percentage Change		
	1986	1987	1988	1986–87	1987–88	1986–88
Value ($ bil.)	26.3	27.9	33.5	6	20	27
Volume (mmt)	109.9	129.2	145.5	18	13	32

From 1986 to 1987 the value gain was from volume. From 1987 to 1988 the value gain was from price and volume. It is notable that the 32 percentage loss in export volume from 1981 to 1986 was precisely equal to the percentage gain in volume from 1986 to 1988. Past export volatility raises questions regarding long-term farm export prospects but compounds difficulties of projecting. The purpose of this paper is to examine export prospects in the intermediate to long run.

The economic future of agriculture is tied to export prospects. Farm commodity prices have closely tracked export volume: High exports and high farm prices have gone together. The farm prices-export fit would be even closer in the absence of government programs cushioning economic impacts of export decline.

Background

Sources of Change in Exports

Geographic sources of the downturn in U.S. exports from 1981 to 1986 are shown in Table 2. Export value losses were broad-based among countries and regions in part because price changes were general. Prices fell an average 8 percent, hence representative

Comments of Carl Zulauf are much appreciated.

Table 2. U.S. Agricultural Exports by Region, Fiscal 1981 and 1986

Region	1981	1986	Change 1981 to 1986 Absolute	Change 1981 to 1986 Percent
	($ Million)			
EC-12	10,576	6,432	−4,144	−39.2
Other West Europe	710	415	−295	−41.6
Eastern Europe	1,940	447	−1,493	−77.0
USSR	1,573	1,105	−486	−30.9
China	2,118	83	−2,035	−96.1
India	324	90	−234	−72.2
Taiwan	1,105	1,109	4	0.4
Japan	6,706	5,139	−1,567	−23.4
Other Asia	5,712	4,073	−1,639	−28.7
Egypt	950	875	−75	−7.9
Nigeria	491	158	−333	−67.8
Other Africa	1,351	1,101	−250	−18.5
Latin America & Caribbean	6,861	3,598	− 3,263	−47.6
Canada[a]	3,154	1,466	−556	−27.5
Oceania	208	216	8	3.7
Total	43,779	26,307	−17,472	−39.9

Source: U.S. Department of Agriculture (August 1988, p. 58, and earlier issues).
[a] Includes transshipments in 1981; these were not included in the change in exports.

Table 3. U.S. Agricultural Exports by Region, Fiscal 1986 and 1988

Region	1986	1988	Change 1986 to 1988 Absolute	Change 1986 to 1988 Percent
	($ Million)			
EC-12	6,432	7,100	668	10.4
Other West Europe	415	500	85	20.5
Eastern Europe	447	600	153	34.2
USSR	1,105	1,700	595	53.8
China	83	500	417	502.4
South & South-East Asia	1,241	1,700	459	37.0
West Asia	1,243	2,100	857	69.0
Japan	5,139	6,600	1,461	28.4
Other East Asia	2,788	4,300	1,512	54.2
North Africa	1,401	1,600	199	14.2
Sub-Sahara	733	600	−133	−18.2
Latin America & Caribbean	3,598	4,000	402	11.2
Canada	1,466	2,000	534	36.4
Oceania	216	200	−16	−7.4
Total	26,307	33,500	7,193	27.3
Developed Countries	13,954	16,700	2,746	19.7
Less Developed Countries	10,719	14,000	3,281	30.6
Centrally Planned Countries	1,636	2,800	1,164	71.2
Total	26,307	33,500	7,193	27.3

Source: U.S. Department of Agriculture (August 1988, p. 58, and earlier issues).

countries with a loss in export value of less than 8 percent expanded import quantity from the United States. Proportionately and absolutely, the European Community (EC-12), China and Latin America were major sources of the decline in U.S. exports. Major absolute losses also came from Eastern Europe, Japan and "Other Asia."

The centrally planned economies contributed significantly to the U.S. export rebound from 1986 to 1988 shown in Table 3. These economies obviously are a continuing source of trade instability. (Data precluded comparison of exactly the same countries in Table 3 as in Table 2). Asian countries made major contributions to the export recovery. Export prices increased on average by 7 percent, hence gains in value in excess of that amount were gains in quantity.

Now turning to U.S. exports by commodity, grains and soybeans (and products therefrom) constituted nearly half of the value of all U.S. exports in FY 1988 (Table 4). Soybeans ranked first in value even though soybean oil and meal exports are included in "Other." Because of their importance, emphasis is on soybeans, coarse grains and wheat in subsequent analysis.

Export Trends

Demand for U.S. farm exports will depend on future trends in foreign supply and demand for food, expecially in Third World coun-

Table 4. U.S. Agricultural Exports by Commodity, Fiscal 1986 and 1988

Commodity	1986	1988	Change 1986 to 1988 Absolute	Change 1986 to 1988 Percent
Soybeans				
Value ($ bil.)	4.2	4.9	0.7	16.7
Volume (mmt)	20.1	21.2	1.1	5.5
Coarse Grains & Products				
Value ($ bil.)	3.8	4.6	0.8	21.1
Volume (mmt)	36.2	52.3	16.1	44.5
Wheat & Flour				
Value ($ bil.)	3.5	4.6	1.1	31.4
Volume (mmt)	26.6	40.2	13.6	51.1
Cotton				
Value ($ bil.)	0.7	2.2	1.5	214.3
Volume (mmt)	0.5	1.4	0.9	180.0
Tobacco				
Value ($ bil.)	1.3	1.2	−0.1	−7.7
Volume (mmt)	0.2	0.2	0.0	0.0
Meat (excluding poultry)				
Value ($ bil.)	1.0	1.2	0.2	20.0
Volume (mmt)	0.5	0.5	0.0	0.0
Other				
Value ($ bil.)	11.8	14.8	3.0	25.4
Volume (mmt)	25.8	29.7	3.9	15.1

Source: U.S. Department of Agriculture (August 1988, p. 57).

tries. Less developed countries accounted for 42 percent of U.S. farm export markets in fiscal 1988 and their share is growing (Table 3). The principal methods of increasing production in the past in these countries offer less opportunity for the future. Major Third World wheat producers—Mexico, India, Pakistan, Turkey and Argentina—now have 84 percent of their total wheat area in high-yielding, semi-dwarf varieties according to CIMMYT. Many of the choice opportunities for expanding both dryland and irrigated cropland have been exploited, especially in Asia where most Third World people live.

It is also well to note that as income improves from subsistence levels, diets shift from sorghum, millet and rice to wheat, and then from wheat or rice to more poultry and red meat. That means that as incomes in Third World countries improve, demand by them for U.S. products tends to shift from wheat to coarse grains and soybean meal used to feed livestock.

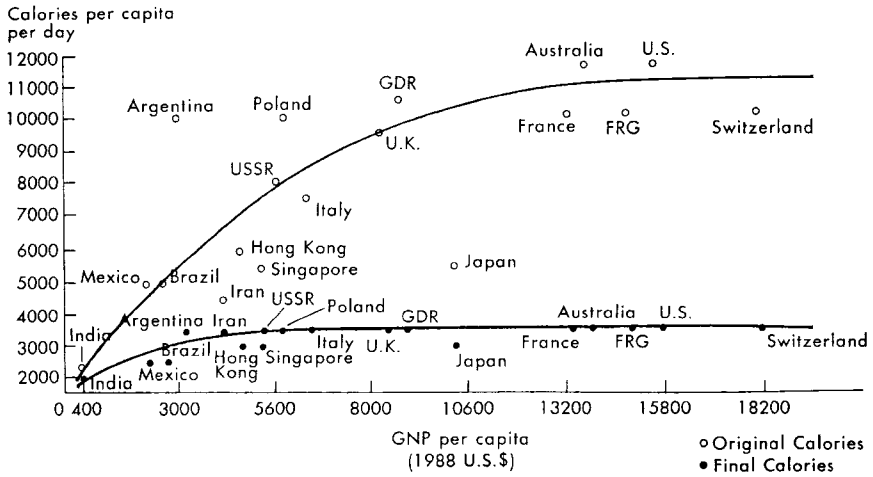
The high income elasticity of demand for U.S. exports in Third World countries is apparent in growth trends. From 1961–63 to 1981–83, for example, developing countries accounted for 63 percent of the gain in U.S. food grain exports, 49 percent of the gain in coarse grain exports and 39 percent of the gain in oilseed exports. In contrast, industrial countries accounted for only 3 percent of the gain in U.S. food grain exports, 23 percent of the gain in coarse grain exports and 44 percent of the gain in oilseed exports.

Change in the volume of export demand over the demographic-economic transition is also notable. Absolute demand for U.S. farm exports is very low in the poorest of the poor countries with high birth and death rates. Need is great but effective demand is small. Often our exports to such countries are concessional. As countries break out of subsistence to rapid income growth, a combination of high population growth (high birth rate, declining death rate) and high income elasticity of demand create strong growth in food demand. Because the education-research institutional structure is inadequately developed to induce high rates of productivity growth and expansion of supply in agriculture, the result is sizable excess food demand that can be satisfied with food imports. The Newly Industrialized Countries (NIC) of Asia fall into this rapid food import growth category. China, Thailand, Malaysia and the Indian subcontinent have potential to reach this category.

As middle-income countries progress, birth rates and population growth slow while high income from nonfarm industry supports farm producer subsidies and trade protection. Superior education-research institutions, along with well-developed industry, turn out improved inputs that spur agricultural productivity. These factors combine to reduce growth in food imports from the United States and other countries.

Figure 1 graphically illustrates these concepts and also points to U.S. export growth prospects. Direct calorie consumption reaches a plateau of just over 3,000 per day at relatively low annual income per capita, approximately $5,000. However, as the composition of those calories changes from direct consumption of grains, fruits and vegetables to include more meat and processed foods, direct and indirect *total* calorie consumption plateaus at nearly 12,000 calories per capita. That is because one pound of grain equivalent can feed a person for a day if eaten directly but four to six pounds of feed are required to produce a pound of pork and eight to ten needed to produce a pound of beef. Thus, countries of the Third World, especially those with rapid income growth, have much potential to expand U.S. coarse grain and soybean imports as they upgrade diets in the process of economic growth. As noted in Figure 1, Japan has potential for more calories because of high income per capita which affords transition to more meat. But diets are constrained by tastes and slowly-changing preferences.

Figure 1. Per Capita Consumption of Primary Food Energy (PFE), Eighteen Countries, 1975–77 Average, Original and Final Calories.



Source: Adapted from Sanderson and Mehra (p. 84).

Developing Countries and Debt Stress

Subsaharan Africa seems to be the only major region of the world losing the capacity to feed itself as apparent in declining food output per capita. In other developing countries, production on average has been increasing more rapidly than population but less rapidly than consumption. This fact, combined with increased production relative to consumption in developed countries, is manifest in growing reliance on grain imports. Grain yield increases since 1970 have been

somewhat comparable in developed and less developed economies (Paarlberg, p. 102; Vocke, p. 22).

The most rapid gains in import demand for farm products have come in higher income developing countries. The debt crisis has slowed import growth in developing countries. The quantity of U.S. agricultural exports to developing countries doubled from 1975 to 1981 for an average gain of 12 percent annually. Exports fell 30 percent from 1981 to 1986 to no small extent because of debt problems.

In the short and intermediate run, international debt stress has pressured countries to expand agricultural and other exports and reduce imports to service debt. Devoting exports to servicing past debt rather than importing productive capital goods to increase income reduces long-term growth and demand for agricultural imports.

Table 5 reveals the stubbornness of the debt problem as apparent in failure of efforts thus far to restructure debt (mostly just extending the payment period), forgive or write-off debt (still modest), and resell debt (now worth only 50 cents on the dollar). The problem not only is most severe in the Western Hemisphere (mostly Latin America) and Africa, but by some standards has worsened since onset of the debt crisis in 1982. Debt as a percent of exports and Gross Domestic Product (GDP) increased steadily in Africa from 1982 to 1988. The ratio of debt to exports and GDP was higher in Latin America than in Africa in 1982 but the former has made progress recently. Although the debt-export ratio remains higher in Latin America than in Africa, the debt-GDP ratio is higher in Africa and is rising. The conclusion is that the debt crisis remains severe, is likely to persist for some years and will require major concessions from banks and governments of creditor countries to bring relief.

Table 5. Relative External Debt of Developing Countries by Region

Region	1982	1984	1986	1988
	(As percent of Exports)			
Western Hemisphere	271	273	350	322
Africa	156	171	237	238
Asia	88	88	101	89
Middle East	46	69	111	108
	(As percent of GDP)			
Western Hemisphere	44	46	45	45
Africa	37	39	50	54
Asia	22	24	29	26
Middle East	22	27	32	28

Source: International Monetary Fund, pp. 180-181.

Since 1982 net debt service payments of developing countries have exceeded new borrowings, hence capital has flowed from Less Developed Countries (LDCs) to Developed Countries (DCs) (Shane and Stallings, p. 13). Substantial latent demand for U.S. farm exports

will emerge if the debt crisis can be addressed successfully. A return to the U.S. export demand growth rate of 12 percent experienced in the 1975–81 period by LDCs is unlikely, but a growth rate of half the level, 6 percent, seems feasible and is consistent with the overall trend in exports from 1975 to 1986. This will not occur, however, without additional writeoff of debt and without strong economic growth in industrial countries which thereby provide markets and foreign exchange for the Third World to service debt.

Although the so-called Newly Industrialized Countries (NIC) of Asia entered the 1980s with considerable debt, these countries have been able to "grow" out of the problem through a strong economic growth performance. The most notable case is South Korea which went from external debt of $47 billion as recently as 1985 to $36 billion in 1987 while debt as a proportion of GNP fell from 56 percent to only 30 percent (International Monetary Fund, p. 86).

As Third World countries approach developed country status, they can afford to, and do, subsidize and protect agriculture. Taiwan and South Korea are likely to be the object of confrontation with the United States over protectionism, with the governments caught between militant domestic nationalists and agriculturalists pressing hard for protection and the United States pressing for liberalization. South Korea recently announced it would reduce tariffs on 436 agricultural imports. Cuts will drop the average tax on imports from the current 25 percent to 20 percent by 1993. Thus current tariffs not only are high but will remain high by 1993 even if the modest cuts are made.

Spurred by deregulation and other incentives, China and India have experienced rapid economic growth in recent years. India, for example, increased manufacturing output an annual average of 9 percent over the past three years. These two countries combined have nine times the population of Japan, South Korea and Taiwan combined. The latter accounted for $11 billion or one-third of all U.S. farm exports in fiscal 1988. No one expects India and China to be scale models of South Korea or Taiwan, but the above numbers emphasize the potential for agricultural trade with continuing institutional reform and economic growth in India and China.

Peoples Republic of China

Economic reforms introduced in 1978—and subsequent modifications increasing privatization, incentives and decentralization of decisions—sharply increased production of crops to 1985. Production gains have slowed substantially since 1985 especially in grains because easy gains from economic reform have been exploited, farmers have followed market incentives to produce cash crops rather than grain and weather has been less favorable.

The Peoples Republic of China (PRC) offers exciting trade poten-

tial because it has several characteristics of Taiwan and South Korea—a high man/land ratio along with a culture conducive to economic growth. The major missing ingredient in China for rapid economic and trade growth is a stable institutional structure allowing markets to work. Based on studies by the Chinese Academy of Agricultural Sciences and the World Bank, the Organization for Economic Cooperation and Development (OECD) (p. 157) concluded for year 2000 "that there would remain a large gap (about 40-50 million metric tons/mmt) [of grain consumption in excess of production] if the higher population variant (1.3 billion) should turn out more realistic—which seems very likely." This compares with net grain imports of 7 million tons in 1985 and 1986. The scenarios would require political stability, continued economic reforms along lines originating in 1978, a more open economy and successful challenge to the traditional doctrine of self-sufficiency. In my judgment there is a 60 percent chance that the PRC will remain a weather market (importing grain in times of below average yields) and a 40 percent chance of becoming a growth market as noted above. That equivocation regarding long-term outlook will be apparent in later projections by other analysts.

Soviet Union

My first priority in a visit to the Soviet Union one year ago was to determine how *glasnost* and *perestroika* would influence their long-term demand for agricultural imports. Soviet agricultural reforms include placing a greater proportion (31 million hectares in 1986, for example) of cropland under "intensive cultivation" with improved varieties and more fertilizer and pesticides, decentralization of decisions (fewer decisions from Moscow, more from contract "brigades" which can be as small as family farm enterprises), and incentives tied to performance. Recently, a plan has been approved to lease land to individual farmers for up to fifty years.

Grain output of 210 mmt in 1986, 211 mmt in 1987, and 205 mmt in 1988 well exceeded the 1981–85 average of 180 mmt. Output remains far short of the 237 mmt produced in 1978 or the 250 mmt target set by the USSR for 1990. The younger Soviet economists I talked to said they believed the country would be self-sufficient in grains by 1990, importing only some higher-quality blending wheat and soybeans. An older economist who had seen numerous previous plans fall short of targets was pessimistic about self-sufficiency in grains. The best guess is that Soviet grain imports will vary widely from year to year and will average closer to the 30 mmt of recent years than to zero.

The European Community

The European Community (EC) went from a 20 mmt grain import position in the late 1970s to a 15 mmt net export position by the

mid-1980s. The EC Commission expected the surplus for export would reach 40 mmt by 1991/92 (Sanderson and Mehra, p. 78). However, the EC is changing policies in ways that will not necessarily expand U.S. exports but will slow inroads of the community into traditional U.S. export markets.

Including the 3 percent producer tax, supports for grains in the EC were reduced 10 percent in 1987 following a similar reduction the year before. The EC also has established a land diversion program and a system of "stabilizers" for grain and oilseeds that will cut support prices automatically if production exceeds specified limits—160 mmt for grains. The changes in policies also will temper import substitution featuring subsidies for domestic oilseed production to crowd out U.S. soybean and corn gluten protected by the General Agreement on Tariffs and Trade (GATT) from direct EC interventions.

Export Assistance

Export assistance programs include credit guarantees, in-kind and cash subsidies, and Public Law 480 food aid. GSM-102 and GSM-103, the former a short-run and the latter an intermediate-term (6 to 36 months) export credit program, protect U.S. exporters against losses from nonrepayment of credit extended by foreign banks for such sales. The Targeted Export Assistance Program (TEA) provides $110 million of in-cash or in-kind subsidies to export mostly high value-added agricultural products. Partly because of TEA, exports of high value (mostly processed) agricultural products increased substantially even as bulk exports were falling in the 1980s. High value exports in fiscal 1988 are expected to reach $15.3 billion or nearly half of all exports (U.S. Department of Agriculture, August 1988, p. 24).

The Export Enhancement Program (EEP) initially was targeted at Middle East markets contested with the EC. The program later was broadened to include the USSR, China and selected other trading partners. EEP outlays totaled $643 million in FY 1987.

The EEP has targeted mainly wheat. Wheat exports increased from a near-term low of 915 mmt in 1985/86 to a forecast 1,500 mmt in 1988/89. An Economic Research Service model attributed 95 percent of the expansion to four factors: (1) EEP, (2) the lower wheat loan rate, (3) reduced wheat yields of competitors and (4) increased imports of centrally planned countries (U.S. Department of Agriculture, July 1988, p. 22). One-third of the three-year increase was attributed to EEP and nearly one-sixth to lower loan rates, provisions introduced by the Food Security Act of 1985. Thus, half of the increase was attributed to implementation of that act. The remainder was due mainly to internal administrative decisions and lower wheat production in the USSR. EEP targets mainly wheat and wheat products accounting for only 14 percent of U.S. exports.

The budget for PL 480 was $1.5 billion in FY 1988 to export 6 to 7

mmt to poor countries. This and other food assistance programs have been critical to increase export buyer power of heavily-indebted developing countries. Fully 30 percent of exports to developing countries have received export assistance in recent years.

The combined spending for PL 480, GSM (subsidy equivalent only), and EEP and TEA was $2.6 billion in fiscal 1987. If each dollar of subsidy generated a dollar of exports, the programs expanded exports 8 percent. And if PL 480 is excluded, programs expanded exports 3 percent. It follows that termination of export assistance, where politically feasible, is unlikely to reduce U.S. farm exports much more than 5 percent overall. Wheat exports especially would fall sharply if export assistance were terminated before world debt and EC export subsidy competition problems are alleviated.

At issue is the future of 1985 farm bill type inducements. EEP, dumping of Consumer Credit Corporation (CCC) stocks and unusually low loan rates were intended to confront EC subsidies and provide bargaining leverage in GATT and other negotiations. They were designed to enable the United States to reduce burdensome stocks through highly competitive pricing in world markets. Continuation of policies subsidizing price below normal world levels after stocks have been reduced to manageable levels angers competitors and utilizes U.S. farm resources that have higher value in other uses. U.S. export subsidies are likely to be reduced in the face of low CCC stocks and tighter supply-demand balance.

GATT and Other Trade Negotiations

In multilateral trade negotiations under the GATT, the United States has called for the elimination of all agricultural subsidies and import barriers by the year 2000. The only acceptable income supports to agriculture would be "decoupled" payments. The United States and the Cairns Group of fourteen countries call for major restructuring of commodity programs unlikely to be acceptable to the EC and Japan. It is doubtful that the U.S. administration could win support for decoupling from Congress, let alone from the EC and Japan where farming interests wield even greater political influence. Perhaps the best that can be hoped for from the Uruguay Round of GATT is enough liberalization to offset the mounting worldwide food market interventions of recent years. TEA and EEP could be bargained away but presumably with offsetting concessions from competitors to help maintain U.S. exports.

Other agreements and negotiations potentially can influence U.S. agricultural trade. In early 1988 Japan agreed to eliminate quotas on eight product categories after a GATT panel ruled that ten quota categories violated GATT rules. Quotas will be eliminated on mostly minor commodities for the United States, including prepared foods, dry beans, sugar and peanuts.

Of greater interest is an agreement to liberalize citrus and beef trade with Japan. The beef-citrus agreement with Japan would eliminate quotas on each commodity by 1991. However, tariffs, now 25 percent on beef, would be raised to 70 percent in 1991 before dropping to 50 percent in 1994. The pact could double beef exports to Japan from 2.1 percent of U.S. production in 1988 to 4.0 percent in 1991. The benefits to the United States from that liberalization will be restrained by competition for the Japanese beef market from Australia and for the citrus market from Southeast Asia. Scaleback of Japanese rice subsidies could have a major impact but such policy change is highly unlikely.

The U.S.-Canada Free Trade Agreement signed 2 January 1988 called for an end to (1) subsidies on agricultural exports to each other, (2) dumping, (3) tariffs on agricultural products by 1998 and (4) some nontariff barriers. As yet, the agreement has not been ratified.

Mexico and the United States signed a bilateral framework to discuss tariff and nontariff barrier reductions. Any thoughts that such negotiations could lead to a U.S.-Mexico or North American free trade area are dampened by intense opposition by U.S. interests fearful of major disruptions from highly competitive Mexican imports produced by cheap labor. A free trade area also is opposed by nonagricultural Mexican industries fearful of losing protection from competitive U.S. industries. Proposals surface intermittently for a U.S.-Japan free trade agreement—proposals that are as promising economically as they are unpromising politically. Numerous other negotiations are underway including a new U.S.-Soviet grain-soybean agreement.

Exchange Rates

Real exchange rates and world commodity prices strongly influence exports. After rising 50 percent from 1980 to 1985, real exchange rates fell approximately 40 percent before rising again in 1988. As of June 1988, real agricultural exchange rates were 77 percent of the March 1973 level (U.S. Department of Agriculture, August 1988, p. 56). According to estimates by economist Ronald McKinnon the dollar was over 30 percent undervalued relative to the yen in August 1988; other currencies were more closely in alignment based on purchasing power parity.

No major realignment of currencies is anticipated in subsequent projections for the next decade but the dollar is expected to remain relatively low while U.S. federal budget and foreign trade deficit problems are being addressed. Macroeconomic policies of the past decade, bringing high real interest and exchange rates and high budget and trade deficits, created massive U.S. debt to foreigners that must be serviced. As a U.S. industry with comparative advantage (see Tweeten, et al., pp. 11–14, for review of literature), agri-

culture will play a key role in servicing that debt. This dimension of trade institutions provides some basis for U.S. farm export optimism.

U.S. Agricultural Export Projections

The above considerations are prelude to the projections of U.S. agricultural exports. Assumptions underlying the analysis herein include steady technological and economic growth and normal weather. A recession is likely to intervene at least once before year 2000 but may not materially influence long-term growth trends.

The quantity of food produced and consumed is demand driven by factors such as income and population and supply driven by factors such as technology and natural resource availability—all mediated by prices, market interventions and random elements. U.S. exports may be viewed as a function of the rate of increase in world production and utilization, world trade in relation to production and utilization, and the share of the United States in that trade.

We first turn to demand. World population growth rates are slowing (Table 6). While the rate of growth fell from 2.2 percent in 1960 to 1.8 percent in 1980, the net addition to population increased from 67 million in 1960 to 80 million in 1980. The rate of world population growth is projected to continue to fall but the absolute annual addition to population is projected to be 92 million by year 2000.

Table 6. World Population Growth Rates

Year	Growth Rate (Percent)	Absolute Growth (Million)
1960	2.2	67
1970	2.0	74
1980	1.8	80
1990*	1.7	89
2000*	1.5	92

* Projected

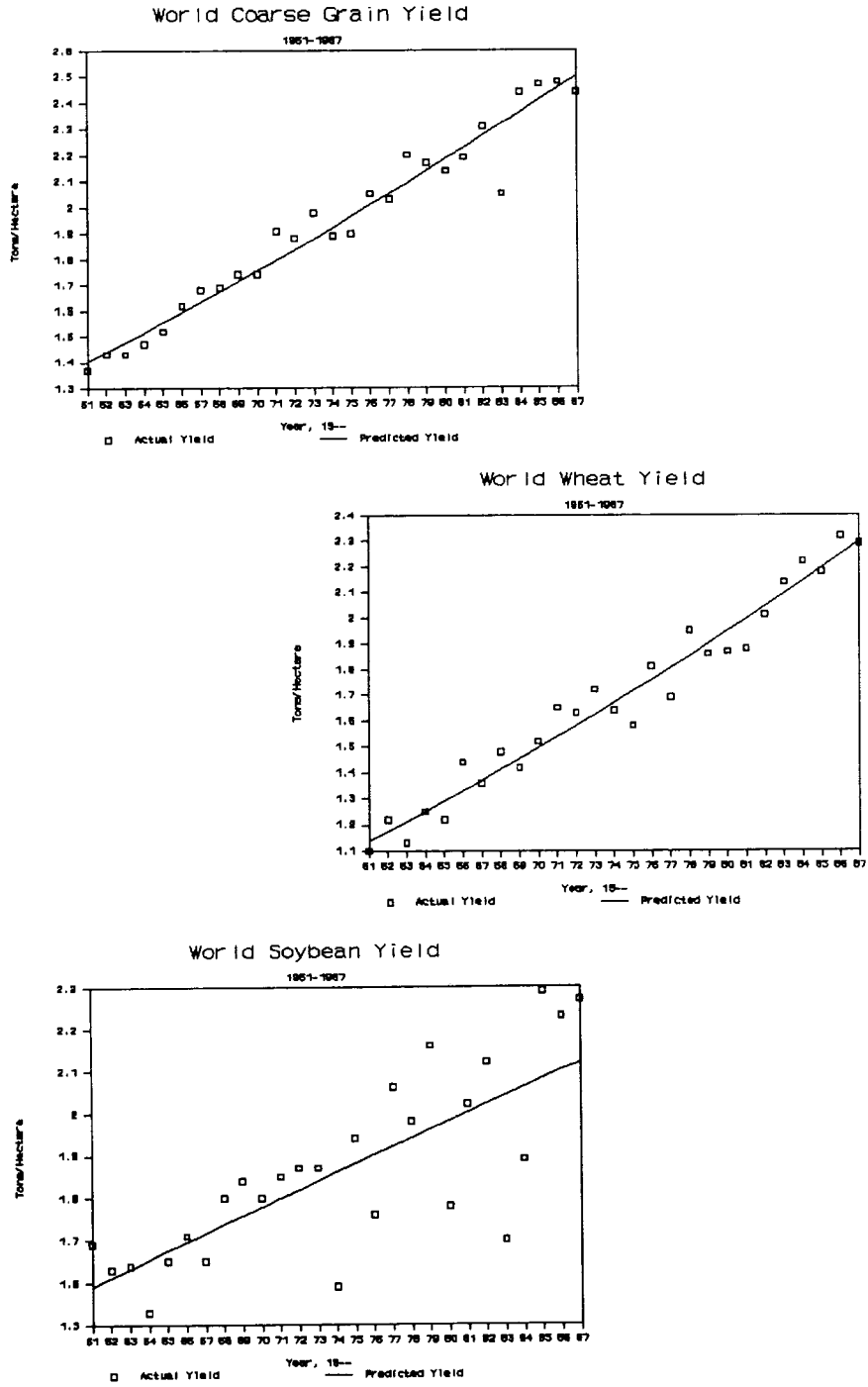
Turning now to supply, productivity, as measured by metric tons of production per hectare, continues to increase in nearly a straight line for coarse grains, wheat and soybeans as shown in Figure 2. The *rate* of increase is slowing. Annual rates of increase in world crop yield per hectare predicted from best-fit regression equation trends shown in Figure 2 are as follows:

Table 7. Annual World Crop Yield Increases

Year	Growth Rate (%)		
	Coarse Grains	Wheat	Soybeans
1960	2.7	3.3	1.3
1970	2.3	2.8	1.2
1980	2.0	2.5	1.0
1990*	1.8	2.2	0.9
2000*	1.6	2.0	0.8

* Projected

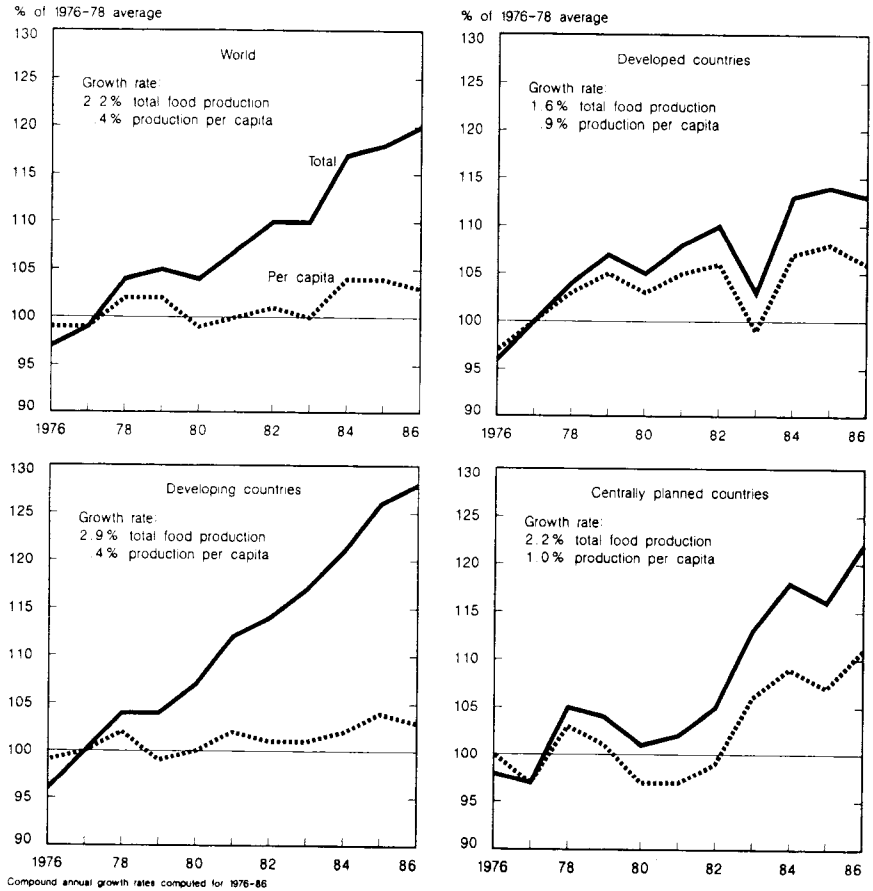
Figure 2. Actual and Predicted Trend Yields of World Coarse Grain, Wheat, and Soybeans, 1961–1987.



Chemicals, improved varieties and irrigation, which have sharply increased yields in the Green Revolution, seem to be losing their momentum. Grain yield gains predicted from past trends by year 2000 will near population growth projected earlier. This suggests competition for food supplies and favorable export markets for countries with a strong agricultural base such as the United States. Of course, new technologies from recombinant DNA and other sources could reverse the slowing productivity trends. An alternative to increasing output is to expand cropland area. But world grain area has remained nearly stable since 1970. Soybean acreage has expanded substantially but that expansion is slowing. Soybean yields vary widely according to Figure 2.

World food production growth has been essentially linear but increased on average by 2.2 percent per year from 1976 to 1986. (Fig-

Figure 3. World Food Production per Capita Trends from 1976–1986.



Source: U.S. Department of Agriculture (April 1988, p. 80).

ure 3). The rate was higher in developing countries (2.9 percent) than in developed countries (1.6 percent). However, per capita production grew more slowly in developing countries because of more rapid population growth. Food production in centrally planned countries grew at the world average rate.

Based on the 1976-86 trend, world food production is increasing 1.9 percent per year and is predicted to increase only 1.6 percent annually by year 2000. On average, world agricultural trade increased 1.3 percent for each 1 percent increase in food production and utilization over the past two decades.

Assuming world food production increases 1.6 percent annually and the elasticity of trade with respect to production is 1.3, agricultural trade is projected to only grow 1.6(1.3) = 2.1 percent annually. If our share of world trade is constant in the long run, U.S. agricultural trade could grow only 2 percent annually on average in year 2000. Of course, cyclical and annual variation around that trend will be substantial.

Turning now to alternative estimates for individual commodities, the rate of commodity export expansion is estimated from the product of (1) the rate of increase in world population, times (2) the elasticity of world utilization with respect to population growth, times (3) the elasticity of world trade with respect to world utilization, times (4) the elasticity of U.S. trade with respect to world trade. Based on elasticities estimated empirically by commodity and based on projected world population growth of 1.5 percent per year in year 2000, the projected rates of growth in U.S. exports are as follows for year 2000:

Table 8. Projected U.S. Export Growth Rate (% per year)

Soybeans	5.7
Coarse Grain	4.5
Wheat	2.7
Weighted Average	4.5

These are probably upper limits because they are from elasticities estimated with historical data from 1961 to 1987. This period was chosen to encompass stable, falling and rising U.S. shares but on the whole was dominated by trade expansion.

World trade in high-value products such as processed foods and meats increased from $60 billion in 1973 to $152 billion in 1986 (Green, p. 6). In real (quantity) terms, the increase was rather steady (averaging 4.8 percent per year) with no significant drop in the mid-1980s. The EC dominates the high-value-added market through heavy subsidies with which the United States may not find it advantageous to compete. However, the United States might reasonably be expected to retain at least its 10 percent of this rapidly expanding market. Combining high-value-added exports with grains

and soybeans, overall U.S. farm export growth could average 5 percent to year 2000 but with substantial year-to-year variation around that trend.

Data from recent studies by the Food and Agricultural Policy Research Institute (FAPRI) and Congressional Budget Office (CBO) (See U.S. Congress) offer significant insight into intermediate-term export prospects. The CBO study projected only to 1993, hence the time period differs from the FAPRI study which projects to 1996. It should also be noted that the 1988/89 data base is not actual exports but estimates assuming normal conditions.

- U.S. feed grain exports are projected to grow 3.6 percent per year according to FAPRI and 3.3 percent per year according to CBO (corn).

- U.S. wheat exports are projected to expand 1.6 percent per year (FAPRI) to 2.4 percent per year (CBO).

- U.S. soybean exports are projected to grow only 1.9 to 2.8 percent per year to the mid-1990s. As projected by FAPRI, this growth exceeds that of competitors—an unlikely prospect unless U.S. policy is changed.

Taking a weighted average of the above projections, U.S. exports of grain and soybeans growth ranges from 2.3 percent per year to 3.0 percent per year using respectively the low and high estimates. These estimates by CBO and FAPRI are at the low end of my earlier projections.

We now combine my earlier projections of 2 to 5 percent export demand growth with estimates of domestic demand growth to project aggregate demand growth for U.S. farm output. The mid-range estimate of population growth by the U.S. Bureau of the Census is 0.6 percent in year 2000. If the domestic income elasticity of demand is 0.05 and real income per capita is growing 2 percent per year, then domestic demand for food will grow $0.6 + 0.05(2) = 0.7$ percent per year in year 2000. If exports grow on average by 2 percent per year from 1988 to 2000, they will account for 26 percent of total demand for farm output by year 2000, hence total demand would be expected to grow approximately $0.74(0.7) + 0.26(2) = 1.04$ percent in year 2000. If exports grow 5 percent from 1988 to year 2000, they will account for one-third of total demand, hence total demand for farm output would be expected to grow approximately $0.67(0.7) + 0.33(5) = 2.12$ percent in year 2000.

These estimates tend to run somewhat below the 1.5 to 2.4 percent annual aggregate supply expansion due to productivity gains projected by the Council for Agricultural Science and Technology (CAST) (Tweeten et al., pp. 15–19). The best guess is that productivity gains will continue slightly to outpace demand expansion by year 2000 and real farm prices will gradually diminish as in the past.

While domestic commodity terms of trade (the parity ratio) probably will fall, factor terms of trade (real price received per unit of real resources) probably will continue to increase because resource productivity is likely to rise faster than real prices fall. Agriculture is likely to remain economically healthy but not necessarily prosperous. No major downsizing of the agricultural plant appears to be called for because of the similarities in rates of expansion of supply and demand. Again it is important to reemphasize that these estimates are subject to considerable error. And there will be sizable variation around the long-term trend. The latter is the major difficulty to producers exposed to export markets.

Conclusions

1. My projections anticipate that overall aggregate U.S. farm export growth will average 2–5 percent per year to year 2000 and beyond. The best guess is an average rate of 3 percent annually. That is sufficient growth to avoid major downsizing of the U.S. agricultural plant. It is insufficient growth to create major capital gains, challenge U.S. production capacity or raise real farm commodity and food prices.

2. Export projections for major commodities vary widely but also tend to fall in the above percentage growth range. My projections anticipate the most rapid gain for soybeans while other sources project most rapid gains for coarse grains among major commodities. Of course, all projections are subject to error.

3. In the 1990s, over half of all U.S. farm export markets are likely to be in

- High value commodities,
- Asia, and
- Less developed countries.

4. While the odds for a *major* upward or downward trend in real farm prices are small, the one constant to expect in exports is variability. Coping with the high annual and cyclical variability that inevitably attends export markets is the major challenge facing U.S. farm policy. Determining the appropriate level of reserve stocks to meet commitments is a major policy issue highlighted by 1988 conditions and the desire of the United States to be a reliable world supplier of food.

5. U.S. agricultural export market potential in east and south Asia (including China) is massive. For that potential to be realized, the developing countries will need to earn more hard currency—that requires open markets in developed countries. The institutional structure in east and south Asian countries has not been conducive to trade in the past but is undergoing major change. If the exemplary

economic institutions of Japan, South Korea and Taiwan are accepted by China and India, the U.S. farm export future is bright.

6. The NICs of Asia constitute continuing, sizable market potential. However, Taiwan and South Korea are becoming so wealthy they can afford to heavily subsidize agriculture. We can expect turbulence as the United States uses ending the NICs' large trade surpluses with us to win reduction of their market interventions.

7. A heavily indebted Latin America is a double threat to U.S. farm exports as debtors at once push farm exports and restrain imports of U.S. farm products. The debt crisis continues to loom large in Subsaharan Africa as well. For U.S. agricultural trade potential to be realized in these areas, greater urgency must be given to alleviating the debt crisis.

8. The European Community is undergoing significant changes in commodity programs. For the United States the issue is not so much one of opening new export markets but to get the EC to diminish the use of subsidies to win new export markets. The EC must also be discouraged from pursuing domestic import substitution to keep out our corn gluten and soybeans. The urgency of EC to negotiate has diminished at least temporarily with drought-induced higher export prices and lower restitution payments.

9. In the long term, it makes little sense to force U.S. export prices to below normal market levels through dumping of CCC commodities or otherwise subsidizing exports. Neither does it make sense to restrict production and hold export prices above normal market levels just because world trade markets are imperfect and other countries subsidize exports and production. We need not "shoot ourselves in the foot" just because other countries delight in "riddling their feet." Bargaining away EEP and TEA in return for like concessions from other countries in GATT negotiations would yield a positive world gain.

10. Finally, key countries to watch for their influence on future U.S. agricultural trade are the Soviet Union, China and India. These countries bear close scrutiny, not only because they are major potential markets, but also because their policies are enigmatic and unpredictable.

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